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RESEARCH ARTICLE

Ethnobotanical Insight and Nutraceutical Potential of the Divine Cuisine of Puri Jagannath Temple, Odisha State, India

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Abstract

Jagannath temple in Puri, Odisha, India, is world famous for its incredible food culture and rituals. Lord Jagannath, Lord Vishnu's incarnation, is worshiped with his elder brother Balabhadra and younger sister Subhadra. The specialty of this temple is that the lords are treated as humans and offered all natural things. All the daily and seasonal rituals are followed in an anthropogenic manner. According to temple rites, six types of Dhupa (sacred food offered to the lord) are carried out daily in Jagannath temple, Puri. The cuisine and the rituals are often considered mystic, and many things remain unexplored. In this present study, the different plants and their products, i.e., leaves, stems, flowers, fruits, and rhizome, including modified, underground stems, are used for making that delicious cuisine are listed along with their possible nutraceutical benefits, which include 69 species, belonging to 61 genera and 36 families. This study also provides knowledge regarding the traditional nutritional dishes of Jagannath temple, the use of different plant parts as food, and their potential health benefits. Our findings and analysis presented in this article may be helpful in understanding the scientific rational of the botanicals used in ritualistic practices.

Keywords: Ethnobotany, Divine food, Jagannath temple, Nutraceutical, Sacred dishes

Introduction

Lord Jagannath of Odisha, India, is considered as the lord of the universe and well known for his mystic food cuisine and tradition. Moreover, Jagannath culture's rituals are just followed as per a traditional book called *"Madalapanji" and record of rights of Jagannath temple*. In India, rituals rely mostly on plants and plant products for different socio-religious activities from early civilization. There are elaborate descriptions of the use of plants in temples and holy rituals in Vedic literature (2000 -1000 B.C.). The same practice has continued till today. Some essential flowering shrubs and trees have always been planted in and around the temple premises and other holy places throughout India, which conserve biodiversity and protect plants from extinction. A similar practice is also observed among the Buddhists (Tai Khamtis) of Assam, who cultivate and conserve certain plant species in their shrines and pagodas (Gogoi and Borthakur 1991). For example, the maintenance of southwest China's holy hills by the Dai people (Pei 1991), sacred groves in the Khasi hills of Meghalaya (Hajra 1987), and some parts of Maharashtra (Vartak and Gadgil 1981). Many trees are considered holy and worshipped in many parts of India (Pande 1964), often contributing to biodiversity conservation. Planting of some flowering herbs and trees in and around the temple yards to meet the day-to-day needs for temple rituals is a usual practice in Odisha state. Holy basils (*Ocimum sanctum*), lawn grass (*Cynodon dactylon*), Bael plant (*Aegle marmelos*), sandalwood (*Santalum album*), and a few flowers are some of the daily requirements for temple rituals. Also, some plants, which are worshipped on specific occasions like Ashoka (*Saraca asoka*) on '*Ashokastami* day' in March-April, Peepal (*Ficus religiosa*) on '*Savitribrata*' in May-June or Amla (*Emblica officinalis*) on '*Aonla Navami*' in November are grown and maintained near the temples along with other plants. Some temples and the '*Mathas*' (the

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residence of ascetics or religious scholars) maintain their flower gardens and orchards as they need more variety of flowers and plants for different deities (Mohanty *et al*. 1997). All these religious practices urge locals to maintain these plants in their backyards or in some specialized places, thereby contributing enormously to their conservation.

Prasad (religious food) plays a vital role in all ritual activities as God and Goddess are offered with various types of dishes, such as *Bhoga/Naivedya*, in different temples of India and distributed among common people and devotees visiting from various places around the world. In Puri Jagannath temple, it is often called *Mahaprasad*, i.e., "Maha" means "great," and "*Prasad*" means "food that is first offered to the lord and then distributed among devotees." Every day, thousands of pilgrims come to Puri to visit Lord Jagannath and take *Mahaprasad* with great explicit. These *Bhogas*/*Prasad* are prepared by using different plants and their products that are cultivated in diverse areas and provide a great opportunity for cultivators in their economic development and also offer livelihood for many people.

Balanced nutrients are required for good health, which provides carbohydrates, fats, proteins, vitamins, and minerals, whose supplements are acknowledged and regulated under food law (Coppens *et al.* 2007). The traditional food of India provides all these ingredients and also helps in reducing varieties of diseases. The dietary offerings of Lord Jagannath are always based on similar traditional formulations; hence, its texture and fragrance always remain the same and exotic by nature. 56 varieties of dishes also termed as *Chhapan bhogo* are used in Jagannath temple on ritual basis, these are *Atakali, Amalu, Aarisha, Anduri, Kadambaa, Kaakaraa, Kaanti, Keli, Kora, Khairichula, Khajaa, Khiri, Khirisha, Khurumaa, Khechudi, Gainthaa, Gajaa, Gotaali, Chakataa, Chakuli, Chitau, Chunchipatra, Jagannathbalaba, Jenaamani, Jhili, Takuaa, Daalimba, Tadiaa, Tripuri, Dhaulaa, Naadi, Panasuaa, Panna, Paachidi, Paapudi, Paalua, Pakhaala, Pithaa, Puri, Puli, Badaa, Balibaamana, Vajaa, Feni, Mandaa, Manohara, Mahaadei, Maandua, Mohonabhogo, Rasaabali, Radhabalhabi, Ladu, Lahuniaa, Laxmibilaasa, Sarasatia, Hansabalhaba*. Approximately more than 120 types of dishes are offered to deities at Jagannath temple, Puri (Mishra 2022). The temple kitchen, where all dishes were cooked for deities, is on the left side of the temple entrance (*Singhadwar* - one of the four doors of Jagannath temple). The temple kitchen has a dimension of approximately 80 feet in width and 100 feet in length with 240 numbers of natural burners (*chulli*) on which varieties of dishes are prepared in special earthen pots by burning wood. The preparation of rice (*arnna*) is very special, in which earthen pots with raw rice and water are kept in decreasing order of their sizes on top of one another on a single burner, and surprisingly, the cooking procedure is completed all at a time. The specialty of this divine kitchen is that approximately one lakh meals can be prepared at a time for devotees. This particular cooking procedure and specificity of the burners are not found anywhere else except the Jagannath temple of Puri. The dimensions of the *chulli* are nearly 2.5ft x 3ft x 3.5ft in width x length x height, respectively.

Traditional food provides a wide range of data regarding the presence of beneficiary elements in them. Nowadays, the use of ayurvedic medicines and phytonutrients is significantly expanding around the world, with many people now turning to these natural products for the treatment of various afflictions in different national healthcare settings (Geneva 2004). Plants also consist of a wide range of non-nutrient phytochemicals, which are synthesized as secondary metabolites and serve a wide range of ecological roles (Naczk and Shahidi 2006). Lord Jagannath and his siblings are considered as the anthropogenic Lord and offered with all-natural plant-based food and dishes. The use of different dishes at different times of the day and different seasons of the year are based on some holy beliefs, yet they are based on some scientific rationale. Hence, this present study is conducted to explore and enlist the plants and their products offered to the Lord in Jagannath temple, Puri. It will further help to enrich our diverse knowledge regarding the traditional nutritional dishes of the temple, the use of different parts of plants as food, and their beneficial effects on human health.

Methods

The survey was carried out for one year (June 2021 to June 2022) to collect all the information regarding different types of dishes that are offered to the Lords of Jagannath temple, Puri. Data collection and the floristic survey were carried out consecutively for two years (from June 2021 to June 2023) in the gardens and cultivated areas near Jagannath temple and nearby areas to collect and identify the plants that are used in temple dishes of Lord Jagannath. Data represented here were collected by interviewing locally learned people attached to temples and different servitors (*Suara sevakas*), who prepare temple dishes for the Lord, as well as by exploring literature and books available in the temple library. Photographs are taken from outside the temple abiding the rules and regulations of the temple, but data collection and sampling of dishes are carried out inside the temple. All the information collected during the study were compiled, analysed and presented in the following results section.

Results

In Puri Jagannath temple, six types of *dhupa* or meals are offered to the lord during different times of a day, starting from early morning till late night, as per temple rites, out of which five are called "*Kothobhogo/Rajbhogo*," and one is "*Bhogomandapa bhogo*". Different routine and special meals along with the different ingredients and dishes offered to the lords were listed and presented in table 1.

Table 1: List of dishes offered daily to the deities of Jagannath temple, Puri

Type	*Sl.*	*Name of dhupa*	*Ritual activities*	*Ingredients/Dishes*
Rajabhogo/ Kothobhogo	1	*Gopalabalhava dhupa*	According to *panchaupachara* (5 steps), *sukhili bhogo* is a simple breakfast provided by certain *mathas*.	Fruits, coconut water, curd, and certain milk products like khuamanda, sara (cream), and sweetened puffed rice (*khai*)
	2	*Sakala dhupa*	According to *sodosa upachara* (16 steps), this is the first meal.	*Khechudi, kaaneka, mahura, besara, saga, daali* etc.
	3	*Madhyarna dhupa*	According to *sodosa upachara,* this is the afternoon meal.	*Thali arna, oriya, pita arna, subasa pakhala, muga dali, mariachipani, pana, sakara, arisa, chadheineda, bada pithaa, chhena pithaa, mathapuli, bada kakara, manohara, khairachula, khirisa, gajaa,takua, mahabira pithaa, pheni, kadambaa,marichinadu, khiri, puspalaka arisa* etc.
	4	*Sandhya dhupa*	According to *sodosa upachara,* this is the evening meal.	*Chupuda pakhala, subasa pakhala, pani pakhala, sakara, chadheineda, knala puli, maatha puli, gotaali, taakuaa, kaakaraa, bada pithaa, luni khurumaa, kadambaa* etc.
	5	*Badasihara dhupa*	According to *panchaupachara,* this is the night meal.	*Sarapuli, subudhi pithaa, suara pithaa, amaalu, taakuaa, khiri, rosopaika pitha, biribuha pitha, bhogo sarapuli, mitha pakhala, subasa pakhala, tava, kadali badaa, kanji, sakara* etc.
Bhogomandapa bhogo	6	*Bhogomandapa bhogo*	This may be carried out twice or thrice daily.	Optional dishes prepared as per the requirements of different *mathas* or temples.

The mystic and divine flavored dishes of Lord Jagannath are prepared in an incredible kitchen. Figure 1 represents the external view of the kitchen and some of the dishes those are available to devotees. It also presents the data curation and exploration processes followed, during the study. The list of plants was prepared and their various uses were enlisted too. Figure 2 represents the images of the various plants and plant parts used to prepare the divine cuisines in Puri Jagannath temple.

A total of 69 species belonging to 61 genera and 36 families have been identified, and they are used to prepare

Figure 1: Images of kitchen, dishes available to devotees and data curation regarding divine cuisine of Lord Jagannath temple

different dishes in Jagannath temple Puri. Different plants whose leaves, stems, flowers, fruits, and rhizome, including modified underground stem or their products, used for making the delicious items are listed in Table 2. The plant data are presented in a consolidated tabular form, highlighting their local name, botanical name, and family, as well as the category of their use for specific purposes, etc., for convenience of study. Different plants or parts used in divine cuisine are always rich in nutrients with evidential health benefits. Hence, the recent literature reference in support of this is also cited in Table 2 to provide an insight that ethnic and divine foods are also based on scientific rationale, rather they are not just used irrationally.

Nearly nine varieties of plant parts like fruit, flower, leaf, stem, seed, rhizome, resins, bark, and root are used for making varieties of dishes, among which maximum types of fruits are used, which include 7 numbers of dry and 26 numbers of fresh fruits. The second most frequently used part is different types of seeds. However, only one bark is used that is derived from the cinnamon plant, i.e., *Cinnamomum verum* J.Presl. Figure 3 represents the comparative analysis of different plant parts used for making temple dishes. Different types of leaves are also used to make these divine dishes as side dishes or flavoring agents. Hence, a comparison of leaves of different plant species belonging to different families is presented in Figure 4. The analysis shows that leaves of Amaranthaceae and Lauraceae are used more often than others. Leaves of different plants are not only used as food but also in making food serving containers or used for different rituals and activities. Therefore, a comparative analysis was done, and the results are presented in Figure 5.

Amomum subulatum Roxb.

Amarathhus oleraceous L.

Amarathhus viridis L.

Anacardium occidentale L

Ananas comosus (L.) Merr.

Annona squamosa L.

Areca catechu L.

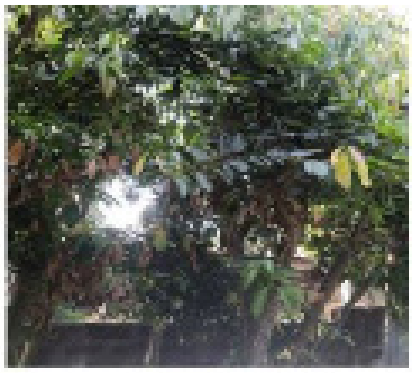
Artocarpus heterophyllus L.

Averrhoa carambola L.

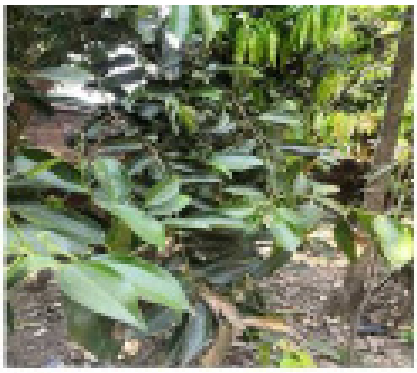
Brassica nigra L.

Cajanus cajan (L.) Millsp

Cinnamomum camphora (L.) J.Presl



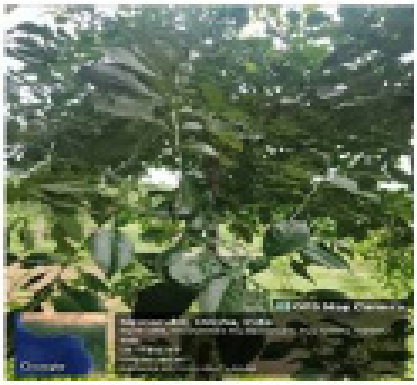
Cinnamomum tamala (Buch) T.Nee & C.H.Eberm



Cinnamomum verum (J.Presl)

Cicer arietinum L.

Citrus grandis (L.) Osbeck

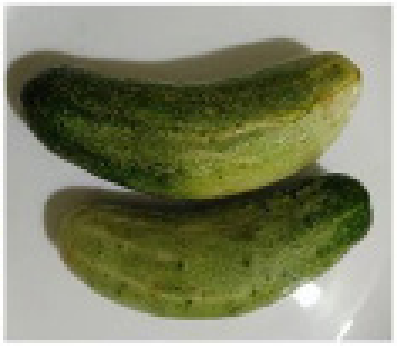


Citrus sinensis (L.) Osbeck

Cocos nucifera L.

Colocasia esculenta (L.) Schott

Coriandrum sativum L.



Cucumis sativus L.

Cuminum cyminum L.

Curcuma amada Roxb.

Curcuma longa L

Dillenia indica L

Dioscoria alta L.

Foeniculum vulgare Mill.

Foenix dactylifera L.

Ferula asafoetida (L.)

Ipomoea batatas (L.) Lam.

Jasminum sambac (L.) Aiton

Litchi chinensis Sonn.

Litsea glutinosa (Lour.) C.B,Rob

Luffa acutangular (L.) Roxb.

Malus domestica (Borkh.)

Mangifera indica L

Momordica dioica (Roxb. ex Willd.)

Manilkara zapota (L.) P.Royen

Musa paradisica L.

Musa sapientum L.

Myristica fragrans Houtt.

Oryza sativa L.

Piper betle L.

Piper nigrum L.

Phaseolus aureus Roxb.

Phaseolus mungo (L.) Hepper

Phyllanthus emblica L.

Prunus amygdalus Batsch.

Psidium guajava L.

Punica granatum L.

Pyrus pyrifolia (Burm.) Nak.

Raphanus sativus L.

Saccharum officinarum L.

Saffron crocus L.

Santalum album L.

Sesamum indicum L.

Sesbania grandiflora (L.) Poiret

Solanum melongena L.

Syzygium aromaticum (L.) Merr. & L.M.Perry

Syzygium samarangense (Blume) Merr. &L.M.Perry

Tamarindus indica L.

Trachyspermum ammi (L.) Sprague ex Turrill

Trichosanthes dioica (Roxb.)

Triticum astivum L.

Vicia faba L.

Vitis vinifera L.

Zingiber officinale Roscoe.

Ziziphus jujuba Mill.

Figure 2: Images of plants and their parts used for the preparation of divine cuisine

Table 2: List of plants and their parts used for making different dishes offered to the deities of Jagannath temple, Puri

Sl no.	*Scientific name*	*Vernacular name*	*Part used*	*Ritual uses*	*Other nutraceutical findings*
1	*Amomum subulatum* Roxb (Zingiberaceae)	*Aleicha*	Seed	*Pahuda niti (bidia), sukhilibhogo anasara pana*a, used as spices	Excellent antioxidant and anti-inflammatory agent (Drishya *et al*. 2022)
2	*Amarathhus oleraceous* L. (Amaranthaceae)	*Kosolaa*	Leaf	*Mahaprasad* as leafy vegetable	Rich in minerals like Na, K, Fe, Ca, etc. vitamins, proteins and carbohydrates and helps to reduce malnutrition (Srivastava 2011)
3	*Amarathhus viridis* L. (Amaranthaceae)	*Leutiaa*	Leaf	Used as leafy vegetable	Good source of Fe, Mg, vitamin C and have good antioxidant properties (Jiménez-Aguilar and Grusak 2017).
4	*Anacardium occidentale* L. (Anacardiaceae)	*Kaju*	Seed	*Mahaprasad* with miscellaneous use	Diverse pharmacological activities and a nutritious food (Shahrajabin and Sun 2023).
5	*Ananas comosus* (L.) Merr. (Bromeliaceae)	*Sapuri*	Fruit	Anasara bhogo as fruit	Over 641 metabolites reported from different types of pineapples with great nutraceutic value (Chen *et al*. 2023)
6	*Annona squamosa* L. (Annonaceae)	*Aata*	Fruit	Routinely offered in *bhogo* as fruit	Rich in carbohydrate, protein, crude fiber, phenolic contents and ascorbic acid, excellent dietary supplement and therapeutic agent with potential antioxidant property (Sarma *et al*. 2015)
7	*Areca catechu* L. (Arecaceae)	*Guaa*	Seed	Refreshment (*bidia*) and miscellaneous use	Ripe nuts have better antioxidant properties than unripe (Rangani *et al*. 2023)
8	*Artocarpus heterophyllus* L. (Moraceae)	*Panasa*	Fruit	*Mahaprasad* as vegetable and fruit	The fruit pulp consists of proteins, carbohydrates, and more than 14 types of amino acids, uronic acid and rich in antioxidants (Zhu *et al*. 2017).
9	*Averrhoa carambola* L. (Oxilidaceae)	*Karamanga*	Fruit	*Mahaprasad* as vegetable	Potent natural antioxidant food (Yan *et al*. 2013)
10	*Brassica nigra* L. (Brassicaceae)	*Sorisa*	Seed	*Mahaprasad* as spices	Seed plays an essential role in human and animal mineral nutrition and caloric nutrition (Gautam *et al*. 2023)
11	*Cajanus cajan* (L.) Millsp (Fabaceae)	*Harad dali*	Seed	Daily bhogo as pulses	Rich in nutrients such as proteins, carbohydrates, and minerals (Mg, K, Ca, Fe, Zn, Mn, Cu, and Cr) (Anjulo *et al*. 2020).
12	*Cinnamomum camphora* (L.) J.Presl (Lauraceae)	*Karpura*	Stem	*Panaa* and daily bhogo. As aromatic water	Rice in phytocompounds with strong antioxidant and anti-inflammatory activities (Zhu *et al*. 2023).
13	*Cinnamomum tamala* (Buch.) T.Nee & C.H.Eberm (Lauraceae)	*Tejpatta*	Leaf	*Mahaprasad* as spices	Profound dietary fiber, protein and fat content with vitamins like ascorbic acid, niacin and traces in riboflavin and folates (Haider *et al.* 2018).
14	*Cinnamomum verum* (J.Presl) (Lauraceae)	*Dalchini*	Bark	*Mahaprasad* as spices	Rich in antioxidant, anti-inflammatory and anticancer biomolecules like cinnamic acid, proanthocyanidins A and B, and kaempferol (Pagliari *et al*. 2023).
15	*Cicer arietinum* L. (Fabaceae)	*Kalabuta / kabuli*	Seed	*Mahaprasad* as pulses	Rich source of carbohydrates, proteins, fibers, minerals, vitamins and contain various unsaturated acids, such as linoleic and oleic acids with some natural antioxidants (Moncini *et al*. 2023).
16	*Citrus grandis* (L.) Osbeck (Rutaceae)	*Tava*	Fruit	*Mahaprasad* as vegetable	Fruit pulp is a good source for dietary fiber (Deng *et al.* 2024).
17	*Citrus sinensis* (L.) Osbeck (Rutaceae)	*Kamala*	Fruit	*Bala bhogo* as fruit	Regulates cholesterol, sugar and triglyceride levels in the body and reported to have antioxidant, anti-inflammatory, anti-diabetic, anti-atherosclerosis, anti-cancer, antibacterial, antiviral properties (Kumar *et al.* 2022)
18	*Cocos nucifera* L. (Arecaceae)	*Nadia*	Drupe	*Mahaprasad* as coolant drink, fruit and vegetable	Rich in dietary fiber, coconut oil have wound healing properties and effective against pathogenic bacteria (Anyiam and Opara 2023).

19	*Colocasia esculenta* (L.) Schott (Araceae)	*Saru*	Rhizome	*Mahaprasad* as vegetable	Rich in proteins, carbohydrates, fibers and anthocyanin act as potent antioxidants (Das *et al*. 2023).
20	*Coriandrum sativum* L. (Apiaceae)	*Dhania*	Leaf, seed	*Mahaprasad* as spices	Numerous nutraceutical properties like antioxidant, antidiabetic, anxiolytic, antidepressant, antibiofilm and antimicrobial activities (Munni *et al.* 2023)
21	*Cucumis sativus* L. (Cucurbitaceae)	*Kakudi*	Fruit	*Bala bhogo* as fruit	Rich in antioxidant and effective in controlling diabetes (Abu *et al*. 2023).
22	*Cucurbita moschata* Duchesne ex Poir (Cucurbitaceae)	*Kakharu*	fruit	*Mahaprasad* as vegetable	Great sources of zinc and copper (Kostecka-Gugała *et al*. 2020).
23	*Cuminum cyminum* L. (Apiaceae)	*Jira*	Fruit	*Mahaprasad* as spices	Seeds are rich in antioxidants and effective against pathogenic bacteria (Noshad *et al*. 2023)
24	*Curcuma amada* Roxb. (Zingiberaceae)	*Amba ada*	Rhizome	Pachedi as spices	A mango flavored spice rich in antioxidants and dietary fibers (Crassina and Sudha 2015).
25	*Curcuma longa* L. (Zingiberaceae)	*Haladi*	Rhizome	*Mahaprasad* as spices	Rich in carbohydrates, proteins fibers, minerals like Ca, K, Mg and Na and consist of multiple therapeutic properties like antiaging, anticancer, antitumor, antiinflammation, etc. (Enemor *et al.* 2020).
26	*Dillenia indica* L. (Dilleniaceae)	*Oou*	Flower	*Mahaprasad*a as vegetable	It has rich nutrients and known to prevent, diabetes, cardiovascular diseases and certain forms of cancer. It is also known to have antioxidant, antibacterial and antimutagenic activities (Nayak *et al.* 2016).
27	*Dioscoria alta* L. (Dioscoreaceae)	*Desialu*	Tuber	*Mahaprasad* as vegetable	Rich in antioxidants and nutrients. Anthocyanin is the major compound that prevents proliferation of cancer cells (Aung *et al.* 2020).
28	*Foeniculum vulgare* Mill. (Apiaceae)	*Panamadhuri*	Seed	*Mahaprasad* as spices	Rich in anti-oxidants and therapeutic properties against various pathogen (Salama *et al.* 2015).
29	*Ferula asafoetida* L. (Apiaceae)	*Hingu*	Resin	*Mahaprasad* as spices	Phenol content and antioxidant is highest among other commonly used spices (Akbarian *et al.* 2017).
30	*Ipomoea batatas* (L.) Lam. (Convolvulaceae)	*Kandamula*	Undergroud stem	*Mahaprasad* as vegetable	Rich in important nutrients like carbohydrates, protein, vitamin C, ascorbic acid (Krochmal-Marczak *et al* 2014).
31	*Jasminum sambac* (L.) Aiton (Oleaceae)	*Malli*	Flower	*Mallifulia pakhala*. as aromatic water	Flowers with antioxidant, whitening, and nontoxic ingredients used in pharmaceutical, cosmeceutical, and food industries (Wu *et al*. 2021).
32	*Litchi chinensis* Sonn. (Sapindaceae)	*Lichu*	Fruit	*Balabhogo*	Pulp of fruit shows strongest scavenging effect of superoxide radical, hydroxyl radical and reducing power (Kong *et al*. 2010).
33	*Litsea glutinosa* (Lour.) C.B,Rob. (Lauraceae)	*Garudagobinda*	Leaf	*Tripuri bhogo* miscellaneous	Leaves are used as traditional medicines rich in antioxidants and flavonoids (Sharma *et al*. 2019).
34	*Luffa acutangula*(L.) Roxb. (Cucurbitaceae)	*Janhi*	Fruit	*Mahaprasad* as vegetable	Carotenoids are major antioxidant contributor of this fruit that could be potential rich source for food, cosmetic and pharmaceutical products. (Suryanti *et al*. 2015)
35	*Malus domestica* Borkh. (Rosaceae)	*Apple (seo)*	Fruit	*Balabhogo*	High phenol content, antioxidant activity and monomeric anthocyanins with therapeutic properties (Maqsood *et al*. 2013).
36	*Mangifera indica* L. (Anacardiaceae)	*Amba*	Fruit, flower	*Mahaprasad*, a special cake where a little bit of flower bud is used. vegetable, fruit, miscellaneous	It exhibits carbohydrates, proteins, amino acids, lipids, fatty organic acids, vitamins and minerals; phytochemicals like polyphenols, pigments, and volatile constituents, along with amino acids like lysine, leucine, cysteine, valine, arginine, phenylalanine, and methionine. The important pigments chlorophylls (*a* and *b*) and carotenoids; organic acids like malic and citric acids increases the nutraceutical value (Maldonado-Celis *et al.* 2019).

37	*Momordica dioica* Roxb. ex Willd. (Cucurbitaceae)	*Kankada*	Fruit	*Mahaprasad* as vegetable	Fruit consists of flavonoids, phenolics, starch, sugar and tannins. It shows pharmacological activities like anti-diabetic, anti-inflammatory & anti-oxidant activities and also rich source of nutrients like proteins, carbohydrates and lipids (Srivastava *et al.* 2023).
38	*Manilkara zapota* (L.) P.Royen (Sapotaceae)	*Sapota*	Fruit	*Balabhogo*	Fruit is fleshy and rich in vitamins, carbohydrates and minerals; phenols, flavonoids, and antioxidants. (Tamsir *et al.* 2020)
39	*Musa paradisiaca* L. (Musaceae)	*Kancha Kadali*	Fruit, stem, leaf	*Mahaprasad* as vegetable; leaf as container	Fruit rich in calories (261.31 kcal/100g) and iron, potassium, phosphorus, calcium recommended as a good source of nutrients (Debnath and Mana 2019).
40	*Musa sapientum* L. (Musaceae)	*Pachila Kadali*	Fruit	*Balabhogo*	Ripen fruits have high calories with delicious taste; domesticated by humans as one of the most economically important crop species (Dahham *et al*. 2015).
41	*Myristica fragrans* Houtt. (Myristicaceae)	*Jaiphala*	Seed and flower	*Anasara panaa* as spices	Essential oils and oleoresins considered as natural food preservative (Kapoor *et al*. 2013).
42	*Oryza sativa* L. (Poaceae)	*Dhana*	Seed	*Mahaprasad arnna* (rice)	It is the principal source of food of many countries and consist many phytonutrients like protein, carbohydrates, phenols, flavonoids etc. (Subbu *et al.* 2023).
43	*Piper betle* L. (Piperaceae)	*Pana*	Leaf	Refreshment (*bidia*) miscellaneous	Leaves show antimicrobial activity and used as food preservatives (Gupta 2023).
44	*Piper nigrum* L. (Piperaceae)	*Golmaricha*	Seed	Spices in *Mahaprasad* and *panaa*	Helps to prevent chronic disease like diabetics and also reduce gastrointestinal disorders (Khan *et al*. 2024).
45	*Phaseolus radiatus* L. (Fabaceae)	*Muga*	Seed	*Mahaprasad* as pulses	Helps to reduce the possibility of heart stork and many harmful diseases (Li *et al*. 2012).
46	*Phaseolus mungo* (L.) Hepper (Fabaceae)	*Biri*	Seed	*Mahaprasad* as pulses	Good source of anti-oxidants and used as food for various countries and reduce harmful diseases (Girish *et al*. 2012).
47	*Phoenix dactylifera* L. (Arecaceae)	*khajur*	Fruit	*Balabhogo*	Adopted as organic and medicinal diets for reducing various diseases (Siddiqi *et al*. 2020).
48	*Phyllanthus emblica* L. (Phyllanthaceae)	*Anla*	Fruit	*Abakaas niti* miscellaneous	Fruit composed of minerals, vitamins C and E, and polyphenolic phytochemicals that may work together to treat infectious diseases, prevent/treat oxidative-damage-related illnesses including Alzheimer's disease (Orabi *et al*. 2023).
49	*Prunus amygdalus* Batsch. (Rosaceae)	*Almond*	seed	*Mahaprasad* miscellaneous	It is good for brain development and the essential oil gives good health and dietary supplements (Ojha *et al.* 2024).
50	*Psidium guajava* L. (Myrtaceae)	*Pijuli*	Fruit	*Balabhogo*	Rich bioactive compounds like phenolics, flavonoids, and carotenoid contents and antioxidant and antibacterial activitis (Bano *et al*. 2023).
51	*Punica granatum* L. (Lythraceae)	*Bedena*	Fruit	*Balabhogo*	Fruit juice and seed rich in Zn, Mn, Mg, Fe and beneficial for hemoglobin deficiency (Ahmed and Ayodele 2023).
52	*Pyrus pyrifolia* (Burm.) Nak. (Rosaceae)	*Naspati*	Fruit	*Balabhogo*	Rich in minerals and vitamins, antioxidants, phenol and flavonoid contents (Singh *et al*. 2017).
53	*Raphanus sativus* L. (Brassicaceae)	*Mula*	Root	*Mahaprasad* as vegetable	Rich source of phytominerals, helps in developing immune modulation through diuresis and detoxification of air pollutants; also exhibit antiinflammatory properties (Lee and Shim 2022).
54	*Saccharum officinarum* L. (Poaceae)	*Aakhu*	Stem	*Mahaprasad* miscellaneous	Stem juice useful in rehydration and possesses some antimicrobial qualities, which could be beneficial in pharmaceutical and food industries (Williams *et al* 2016).

55	*Saffron crocus* L. (Iridaceae)	*Kesar*	Flower	*Ghasajala, panaa* as spices	Natural coloring and flavoring agent, also used for its antioxidant and sensorial properties (Armellini *et al.* 2018).
56	*Santalum album* L. (Santalaceae)	*Chandana*	Stem	*Panaa* as aromatic water	Rich in phytochemicals like alkaloids, saponin, phenols, tannins, flavonoids and carbohydrates, and possesses antioxidant and pharmacological activities used for the treatment of stomach, cardiovascular and liver ailments (Mehvish and Barkat 2018).
57	*Sesamum indicum* L. (Pedaliaceae)	*Rasi*	Seed	*Ladu* miscellaneous use	Rich in minerals i.e. Mn, Na, Zn, Fe; contain significant amounts of phenolics, flavonoids, nutrients and minerals with significant antioxidant activity. Its dietary uptake could be potentially protective against various diseases (Dravie *et al*. 2020).
58	*Sesbania grandiflora* (L.) Poiret (Fabaceae)	*Agasti*	Leaf	*Mahaprasad* as vegetable	considerable amount of antioxidant activity (Arthanari and Periyasam 2020).
59	*Solanum melongena* L. (Solanacea)	*Baigana*	Fruit	Dahibaigan: A special dish made with curd	Fruit contains phenolic compounds, including flavanols, ortho-dihydroxy phenols, quinones and chlorogenic acid (Sharma *et al*. 2019).
60	*Syzygium aromaticum* (L.) Merr. & L.M.Perry (Myrtaceae)	*Labanga*	Flower	Bidia as spices	Possess antimicrobial and antioxidant properties. Eugenol is the major bioactive compound of the clove (Hossen 2019).
61	*Syzygium samarangense* (Blume) Merr.&L.M.Perry (Myrtaceae)	Jamurolo	Fruit	*Balabhogo*	Rich in antioxidants and organic acids and many macro nutrients. (Smith *et al*. 2023)
62	*Tamarindus indica* L. (Fabaceae)	*Tentuli*	Fruit	*Sakaraa* preparation miscellaneous	Rich in phenol and antioxidants with medicinal properties; largest amounts of glucose and tartaric acid make it natural preservatives (Tril *et al*. 2014).
63	*Trachyspermum ammi* (L.) Sprague ex Turrill (Apiaceae)	*Juani*	Seed	*Sukhili bhogo* as spices	Rich in antioxidants and minerals like Cu, Zn, Mn and used in different therapeutic formulations (Selvaraj *et al*. 2021).
64	*Trichosanthes dioica* Roxb. (Cucurbitaceae)	*Potola*	Fruit	*Mahaprasad* as vegetable	Helps in controlling sugar and in diabetes (Rai *et al*. 2013).
65	*Triticum astivum* L. (Poaceae)	*Gahama*	Seed	*Sukhilbhogo* as cereals	Staple food in many countries , rich in natural antioxidants, phenols, and flavonoids with therapeutic properties (Ciccoritti *et al*. 2013).
66	*Vicia faba* L. (Fabaceae)	*Simva*	Fruit	*Mahaprasad* as vegetable	Functional leguminous food for its bioactive compounds and nutritive values (Barbosa *et al*. 2024).
67	*Vitis vinifera* L. (Vitaceae)	*Angur*	Fruit, dry fruit	*Mahaprasad*	Rich in antioxidant and phenolic content makes it functional biomedical fruit (Luque-Alcaraz *et al*. 2024).
68	*Zingiber officinale* Roscoe. (Zingiberaceae)	*Ada*	Rhizome	*Mahaprasad* as spices	Monoterpenes and sesquiterpene show antimicrobial activity against various infectious agents (Abdullahi *et al.* 2020).
69	*Ziziphus jujube* Mill. (Rhamnaceae)	*Barakoli*	Fruit	*Mahaprasad* Vegetable	Rich in vitamin C, phenol and flavonoids; used in different food items i.e. jams, pickles, beverages, and jellies (Shams *et al*. 2021).

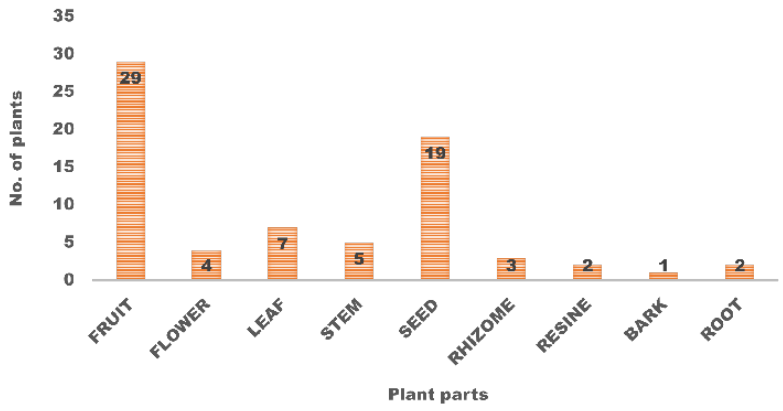


Figure 3: Comparison of different plant parts used in the preparation of different temple dishes

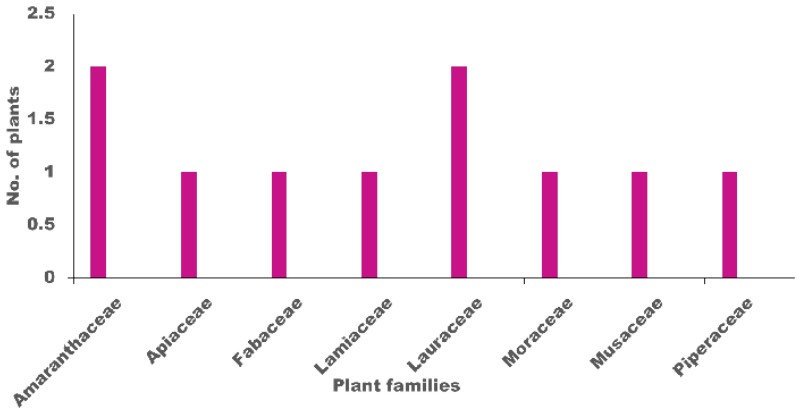


Figure 4: Comparison of different leafy plants and their families used in *Mahaprasad*

The plants listed in Table 2 are classified under six different categories for easy understanding and comparative analysis that is discussed below:

1. Plants used as spices

Seventeen plants belonging to eight families are used as spices in temple food. A maximum of five species are from the Zingiberaceae and Apiaceae families, two each from Myrtaceae and Lauraceae, and the three families contribute only one species that is used as spices/condiments for temple dish preparation. This is graphically presented in Figure 6**.**

2. Pulses used in divine cuisine

Pulses of 4 species belonging to the family Fabaceae are used in the Puri Jagannath temple. The white and brown seed varieties of species *C. arietinum* are extensively used in making curries (besar, kabuli and mahur) and *Phaseolus arueus* is mixed with rice to make khichdi, which is considered to be healthy and also regarded as a good source of protein, carbohydrate, vitamins, beta- carotene and essential fatty acids (Jukanti *et al.* 2012). The nutritive values and their supportive nutraceutical efficacies are presented under the reference column in table 3.

3. Plants used for aromatic fragrance

Three plants belonging to three different families are used for the most famous and special divine aromatic dish of Odisha, i.e., pakhaala, which is a mixture form of cooked rice, water, and a few other aromatic substances. In Jagannath culture, Puri, varieties of *pakhaala* are offered to Lord Jagannath like *subaasa pakhaala* that has aroma from flowers of *J. sambac*. Other two plant parts, like the stem of *S. album* and extract from *C. camphora* is used to prepare flavored drinks for the lords in different occasions. All these divine offerings are later distributed among the devotees.

4. Vegetables used for making dishes

Different plant parts derived from 21 types of plants belonging to 16 families are used to prepare various divine dishes, among which some are seasonal, and few are used daily. According to their use, they are further classified into three types, i.e., daily (43%), seasonal (48%), and special (10%), which is presented in Figure 7.

5. Fruits used for spiritual offerings

Fruits of 17 plant species belonging to 14 families are used to prepare divine food.

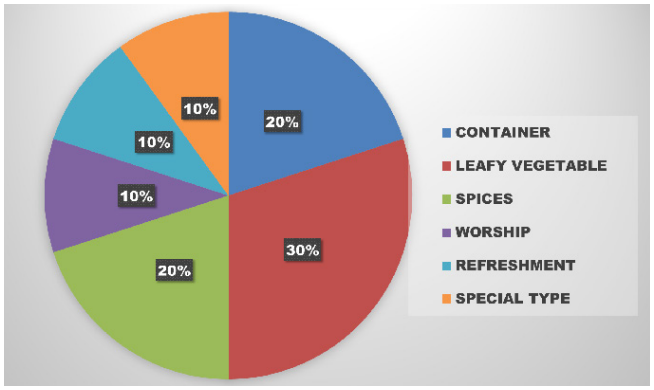


Figure 5: Comparison of leafy plants used for varied temple rites

Table 3: Nutritional values of the pulses used in Jagannath Temple, Puri

Pulses	*Protein (%)*	*Carbohydrate (%)*	*Essential fat (%)*	*References*
Cajanus cajan (L.) Millsp	20-22	65	1.2	Solomon *et al.* 2017
Cicer arietinum L.	15-22	40-60	4-8	Madurapperumage *et al.* 2021
Phaseolus aureus Roxb.	27.5 - 21.3	54.35 - 55.85	1.3 - 1.6	Lee *et al.* 2019
Phaseolus mungo (L.) Hepper	23.91 - 26.01	54.41 - 57.45	0.93 - 1.21	Kanth *et al.* 2021

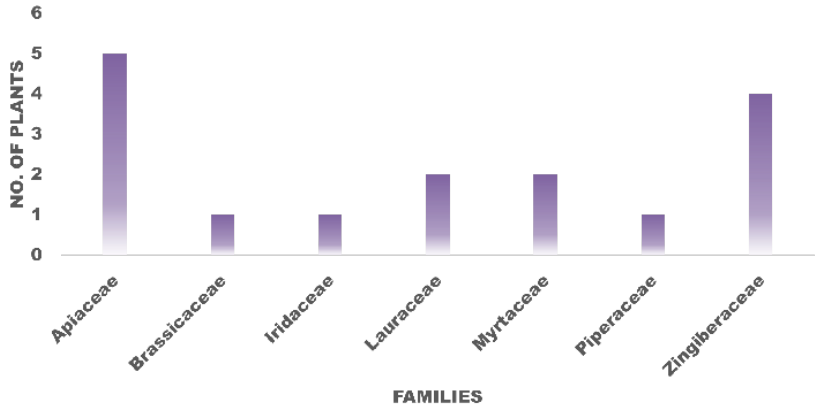


Figure 6: Comparison of plants from different families used as spices to prepare different dishes

6. Cereals used for making dishes

Seeds of two plants of the family Poaceae are used for making different types of dishes and offered to Lord Jagannath, like cooked rice, puffed rice, a certain type of cake with *O. sativa*, and different types of dry dishes (*sukhili bhogo*) from *T. aestivum* seeds.

7. Other miscellaneous uses

There are around 10 different plants that are used on special occasions, like flowers of *M. indica* used for making cakes during *Baula amabasya* festival, seeds of *S. indicum* for making sweet balls like *Rasi Laduu,* and leaf extract of *L. glutinosa*, used for making cakes called *Tripuri bhogo*.

Discussion

Fruits and vegetables have been included in human diets since ancient times. The dishes offered to the deities of Sri Jagannath temple, Puri, are unique and not found anywhere else worldwide. The cooking style, ingredients, taste, aroma, and flavor are amazing and give them an inimitable identity. The dishes are delicious and consist of proteins derived from pulses, carbohydrates from cereals, different vitamins from leaves and vegetables, and natural antioxidants from various fruits. Specific use of a limited number of spices makes the food tasty and flavorful, and it is healthier too with their antimicrobial properties and anti-inflammatory activity. Food supplemented with seeds of *P. nigrum* and dried powder of rhizome of *C. longa* reduced postprandial glycemia, hunger, and perceived eating ability without affecting gastrointestinal well-being (Khan *et al*. 2024).

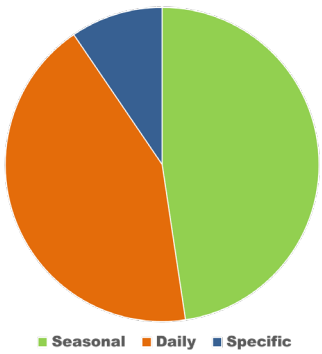


Figure 7: Vegetable categorization according to their use

The nutritional offerings to Lord Jagannath are mostly plant-based natural products and do not contain any artificial products or chemicals. Only natural plant-based spices are used to enhance celestial dishes' flavor, color, and texture. Hence, the diet of Sri Jagannath is considered as divine and Sattvik. Commonly cooked dishes like Besara, Dalmaa, and Mahura contain a few selective vegetables and pulses, adding to their nutraceutical properties and texture. It consists of *Dolichos alba,* rich in essential amino acids, proteins, and carbohydrates (Huang *et al*. 2007). *Raphanus sativus* is rich in phosphorous, *M. paradisiaca* is rich in iron, fiber, carbohydrates, low-fat content, and minerals K, Mg, Ca, Na, P, and N (Oyeyinka and Afolayan 2019). Some fruits like jackfruit and mango are used as raw vegetables during their early stage for making *Mahaprasad* and also offered as ripened fruits later. Green coconut water is offered daily as a divine drink, and the solid endosperm is also used for cooked meals and many other dry dishes (Mishra and Nandi, 2007).

The leaf of *Sesbania grandiflora* is used only in the holy month of Kartik to make dishes, not at other times, most probably to overcome microbial infection during climatic conditions because these plant leaves contain anti-bacterial properties, anti-inflammatory, anti-tumor, and contraceptive properties (Mohiuddin 2019). Although the plant contains two types of flower varieties (white and red), only the leaves of white-flowered variety plants have been reported to be used in the temple (Silalahi 2023). Similarly, a leaf extraction of *L. glutinosa* is made by manually crushing the leaves with water to make a mucilaginous puree to prepare a special dish called Tripuri, which is not reported elsewhere except in Jagannath temple, Puri. This is used for many gastrointestinal

ailments and diseases like abdominal pain, indigestion, and diarrhea, as well as gastroenteritis and edema, traumatic injuries, diabetes, colds, arthritis, and asthma. People of Puri district use these leaves as a syrupy drink with raw sugar (Chawra et al. 2021). Hence, it can be suggested that the use of different botanicals in temple dishes is not blindly followed. Rather, sufficient scientific rationales lie behind their uses.

Different dishes offered to the Lord, including their leftovers or remnants, are used multifariously. Devotees take them to cure and heal from many diseases. The remaining cooked rice is processed in a unique way to prepare a fermented liquid by temple servitors called "*Tankatorani*." It is believed to have many curative properties against different diseases, including different types of stomach disorders, and local people drink it with lots of faith and anticipation. Spices like *A. subulatum, S. aromaticum, Z. officinale* have high content and a variety of flavonoids, terpenoids, glycosides, vitamins, minerals, carbohydrates, proteins, and fats, which make them potential nutraceuticals. Food enriched with cinnamon and cardamom retains the bioactive properties of the spice (Pagliari et al. 2023). Spices like cumin and coriander are used to elevate flavor and increase food's antioxidant and anti-inflammatory properties (Noshad *et al*. 2023). *A. viridis* had the maximum concentrations of Fe, which is an essential nutrient (Jiménez-Aguilar *et al*. 2017).

Conclusion

In India, Sattvik foods are always prioritized over Tamasic or animal-based food. There is also a strict rule for using specific fruits, vegetables, condiments, etc., in preparing different dishes in Jagannath temple; other than that, no other fruits and vegetables are allowed in Puri Jagannath temple. This piece of work shows that maximum plant parts of species belonging to the family Fabaceae are used for making such divine food for Sri Jagannath temple. Temple food is considered to be very healthy because of its ingredients, which are purely plant and milk-based. Sattvik food gives mental peace and its components help in inhibiting harmful diseases. Regular consumption of such plant-based food helps to reduce the chances of harmful diseases due to their extensive medicinal properties.

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Author contribution

JD collected data and drafted the manuscript; SD designed content, discussion, and future directions; both authors read and approved the final manuscript.

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Availability of data and materials

All the data collected and analyzed were included in the manuscript and will be available upon reasonable request from the corresponding author.

Declaration

Ethics approval and consent to participate

Not applicable

Consent for publication

Each author agrees to this publication.

Competing interests

Both authors declare there is no competing interest regarding this publication.

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